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TESTS FOR THE PRODUCTION OF CONSTRUCTION MATERIALS FROM RECYCLED WASTES

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Abstract. *The main one of the few ways to satisfy the needs and requirements of the construction industry, regarding the types and quality of materials, is the processing of waste from the metallurgical, chemical and energy industries, extracted products and the enrichment of processing waste, mineral raw materials, and secondary resources. The purpose of the tests was to study conducting research to study the suitability of secondary tailings for the manufacture of various types of building materials. One of the surest solutions to industrial waste problems is the introduction of waste-free technologies. Effective disposal of man-made waste will significantly reduce the load on the ecosystem and the cost of finished products of manufactured building materials. One of the surest solutions to industrial waste problems is the introduction of waste-free technologies.*

Keywords: *stale wastes, tailings pond, ceramic bricks and tiles, granulated paving stones, concrete tiles, concentrate, secondary tailings, construction materials.*

ИСПЫТАНИЯ НА ПРОИЗВОДСТВО СТРОИТЕЛЬНЫХ МАТЕРИАЛОВ ИЗ ОТХОДОВ ПЕРЕРАБОТКИ

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Аннотация. *Основным из немногих способов удовлетворения потребностей и требований строительной отрасли в отношении видов и качества материалов является переработка отходов металлургической, химической и энергетической отраслей, экстрагированных продуктов и обогащение отходов переработки, минерального сырья и вторичных ресурсов. Цель испытаний заключалась в изучении проведения исследований по изучению пригодности вторич -*

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ных отходов для изготовления различных видов строительных материалов. Одним из наиболее надежных решений проблем обращения с отходами является внедрение безотходных технологий. Эффективное удаление техногенных отходов позволит значительно снизить нагрузку на экосистему и стоимость готовой продукции изготовляемых строительных материалов. Одним из наиболее надежных решений проблем обращения с отходами является внедрение безотходных технологий.
Ключевые слова: *лежалые отходы, хвостохранилище, керамический кирпич и черепица, гранулированная брусчатка, бетонная плитка, концентрат, вторичные хвостохранилища, строительные материалы.*

IKKILAMCHI CHIQINDILARDAN QURILISH MATERIALLARI ISHLAB CHIQARISH UCHUN SINOVLAR

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Annotatsiya. *Qurilish sanoatining materiallar turi va sifatiga bo‘lgan talab va ehtiyojlarini qondirishning asosiy usullaridan biri metallurgiya, kimyo va energetika sanoati chiqindilarini qayta ishlash, ajratib olingan mahsulotlar va qayta ishlash chiqindilari, mineral xomashyo va ikkilamchi resurslarni boyitish hisoblanadi. Sinovlarning maqsadi ikkilamchi chiqindilarning turli xil qurilish materiallarini ishlab chiqarish uchun yaroqliligini o‘rganish bo‘yicha tadqiqotlar olib borishni o‘rganish edi. Sanoat chiqindilari muammolarining eng ishonchli yechimlaridan biri bu chiqindisiz texnologiyalarni joriy etishdir. Texnogen chiqindilarni samarali utilizatsiya qilish ekotizimga tushadigan yukni va tayyor qurilish materiallarining tayyor mahsulot tannarxini sezilarli darajada kamaytiradi. Sanoat chiqindilari muammolarining eng ishonchli yechimlaridan biri bu chiqindisiz texnologiyalarni joriy etishdir.*
Kalit so‘zlar. *ikkilamchi chiqindilar, chiqindixona, sopol g‘isht va plitkalar, granulalangan beton plitkalar, beton plitkalar, kontsentratlar, ikkilamchi chiqindilar, qurilish materiallari.*

Introduction. One of the surest solutions to industrial waste problems is the introduction of waste-free technologies. Effective disposal of man-made waste will significantly reduce the load on the ecosystem and the cost of finished products of manufactured building materials. The formation of waste-free production is implemented through radical modification of technological processes, creating a system with a circular cycle that ensures the reuse of raw materials. The integrated use of such materials is explained by the fact that industrial waste from some industries are the starting raw materials of others. The issue of secondary use of such raw material is the actual nature of the 21st century. The main problems associated with industrial waste at various stages of production. Manufactured analysis in percentages the amount obtained during the production of secondary raw materials are given the general features of the technological process in the individual enterprises [1].

The production of building materials and their use in the national economy has its own history. Clay was considered the most common building material in ancient times. Clay has been used as a building material since the beginning of human development. As he made all kinds of objects from human hair, he also discovered drying and burning it in order to increase their durability [2].

When processing ore raw materials enriched by flotation, not only various flotation reagents, collectors, and technological parameters are

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important, but also the size of the mineral raw materials to obtain the concentrate. Since the cost of obtaining concentrate, grinding ore to the required size is 30-50%. [4] One of the most important tasks in the processing of mineral raw materials is the ability to correctly determine the parameters that can influence the beneficiation processes depending on the characteristics of the ores, the distribution of minerals and the content of useful components in them. It should be noted that to obtain high-quality concentrates, the size of the ore grinding is no less important. [5] During the research period, tests were carried out on the production of more types of building materials. As a result of the research, the optimal compositions of the charge consisting of secondary wastes, additional impurities and the necessary reagents for the production of building materials were determined, technological process modes were determined, and samples of building materials and mineral fertilizers based on secondary wastes were obtained. In this article the research results will be used in the processing of old wastes from Copper Beneficiation Factoriy-1 of Almalyk MMK (OW CBF-1). Research to study the suitability of secondary wastes for the manufacture of various types of building materials was carried out at the Experimental Technological Center of the "Institution of Mineral Resource".

Tests for the production of ceramic bricks. Tests to produce ceramic bricks from recycled wastes were carried out using different proportions of wastes, clay (loess), kaolin and iron oxides (red iron). Tests for the production of ceramic bricks from recycled wastes and the necessary additives were carried out using the following method:

- mixing the prepared mixture into dry mixture;
- mixing the mixture with the addition of 5-10% water;
- keeping in a sealed container for 24 hours;
- placement in a pre-oiled form;
- pressing in a mold with a press force of 150 kN;
- drying the finished form at a temperature of 60°C for 8-10 hours;
- sintering of the dried form at a temperature of 1050°C for 1 hour.

Below is the composition of the charge for producing ceramic bricks (Table 1).

Table 1

Composition of the charge for producing ceramic bricks

Products for blending	Quantity, %		
	Experience №1	Experience №2	Experience №3
Secondary waste	80	70	60
Clays	10	15	20
Kaolinite	10	15	20
Iron oxides (iron lead)	1	1	1

Note. Clay was added to improve the plasticity properties. Kaolin was added to improve ceramic properties. Lead iron was used as a pigment to impart appropriate brown color.

Fig.1. The process of producing ceramic bricks.

The result of the change in the production of ceramic bricks is that with the addition of source materials and compliance with the appropriate regimes, the secondary wastes of the OW CBF-1 are suitable for the production of ceramic building bricks.

Tests to produce ceramic permeable granular paving stones. Tests to produce ceramic granular permeable pavers from recycled wastes were carried out using different proportions of wastes, kaolin, potassium and sodium feldspars. Tests for the production of ceramic granular permeable paving stones from recycled wastes and the necessary additives were carried out using the following method:

- mixing the prepared mixture into dry mixture;
- mixing the mixture in a granulator with the addition of water until spherical granules are obtained;
- adding glass and kaolin powder;
- placement in a pre-oiled form;
- pressing in a mold at a pressure of 0.5-3 MPa;
- drying the finished form at a temperature of 60°C for 12-14 hours;
- sintering of the dried form at a temperature

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of 1130°C for 1 hour.

Below is the composition of the charge for producing ceramic granulated paving stones (Table 2).

Table 2

Composition of the charge for producing ceramic granulated paving stones

Products for blending	Quantity, %				
	Ex-perience №1	Ex-perience №2	Ex-perience №3	Ex-perience №4	Ex-perience №5
Secondary waste	50	50	50	50	50
Kaolinite	30	30	30	30	30
Potassium feldspars	10	10	10	10	10
Sodium feldspars	10	10	10	10	10
Granule size, mm	-4+2,5	-7+2,5	-8+4	-8+4	-4+3,5
Press pressure, MPa	3,0	0,5	1,0	2,0	1,0

Note. Kaolin was added to improve ceramic properties. Sodium and potassium feldspars were added to improve ceramic and strength properties.

Experiments have shown that without the use of the sintering process, the strength of the paving stones turned out to be unsatisfactory; after pressing, the paving stones, even at elevated press pressures, crumble into pieces.

Fig.2. The process of producing ceramic granular permeable paving stones.

Also, as a result of testing different granule size parameters, it was found that durable paving stones can be obtained by using smaller granule size classes. The test results for the production of ceramic granular permeable paving stones showed that with the addition of the necessary additives and compliance with the appropriate regimes, the secondary wastes of OW CBF-1 are suitable for producing ceramic granular permeable paving stones, which can be used to cover pedestrian roads and squares.

Tests for the production of concrete tiles (paving stones). Tests to produce durable concrete tiles (paving stones) from recycled wastes were carried out using different proportions of wastes, quartz sand, cement and water. Tests for the production of concrete paving stones from secondary wastes and the necessary additives were carried out using the following method:

- mixing the prepared mixture into dry mixture;
- mixing the mixture with the addition of 15% water;
- placement in a pre-greased mold;
- pressing in a mold with a press force of 150 kN;
- drying the finished form at room temperature for 3-5 days.

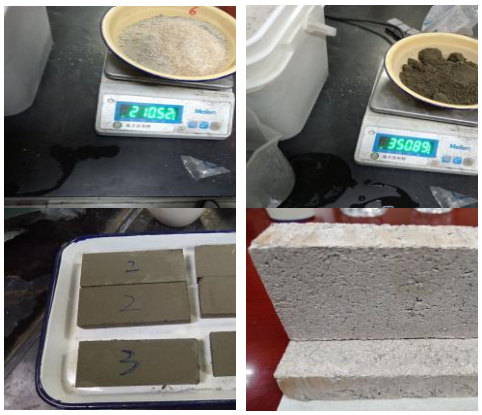
Below is the composition of the charge for producing concrete paving stones (Table 3).

Table 3

Composition of the charge for producing concrete paving stones

Products for preparation of the charge	Quantity, %		
	Experience №1	Experience №2	Experience №3
Secondary tails	50	40	30
Quartz sand	30	35	40
Cement M425	20	25	30
Water	15	15	15

Note. Quartz sand was added as a filler and improvement strength characteristics of paving stones. Cement was added as a binder.



The results of tests on the production of

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concrete paving stones showed that when adding the necessary additives and following the appropriate regimes, the secondary wastes of OW CBF-1 are suitable for producing durable gray concrete paving stones. The color of the paving stones can be adjusted by adding the necessary color pigments.

Conclusion. Based on the research conducted, the possibility of obtaining various types of building materials based on secondary wastes that meet the requirements of the relevant State Standards has been practically proven [3], the optimal modes and parameters of technological processes for the production of building materials have been determined, and samples of more than 10 types of building materials have been obtained (ceramic bricks and tiles, granulated paving stones, concrete tiles, granulated permeable tiles, aerated concrete, foam concrete, ceramic aerated concrete, ceramic faience tiles, glassy decorative stone).

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